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ORIGINAL ARTICLE

Magnetohydrodynamic double diffusive natural convection in trapezoidal cavities

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Abstract A numerical work has been carried out to study the effects of magnetic field on double diffusive natural convection in a trapezoidal enclosure. Both inclined walls and bottom wall were kept at constant temperature and concentration where the bottom wall temperature and concentra-tion are higher than those of the inclined walls. Top wall of the cavity is adiabatic and impermeable. The trapezoidal enclosure is subjected to a horizontal magnetic field. To investigate the effects, finite volume method is used to solve the governing equations for different parameters such as Grashof number, inclination angle of inclined wall of the enclosure, Hartmann number and buoyancy ratio. The numerical results are reported for the effect of studied parameters on the contours of stream-line, temperature, and concentration. In addition, results for both local and average Nusselt and Sherwood numbers are presented and discussed for various parametric conditions. This study is done for constant Prandtl number, Pr = 0.7; aspect ratio = 1 and Lewis number, Le = 2. The studied range of Grashof number is from Gr = 10^3 to 10^6, inclination angle from 0L to 75L, Hart-mann number from 0 to 15 and buoyancy ratio from 2 to 2 which covers the double diffusive range in the cases of aiding and opposing flows. It is found that heat and mass transfer decreased as u increases from 0L to 75L. Also heat and mass transfer decreased as Hartman number increased from 0 to 15. Finally, the predicted results for both average Nusselt and Sherwood numbers were correlated in terms of the studied parameters.